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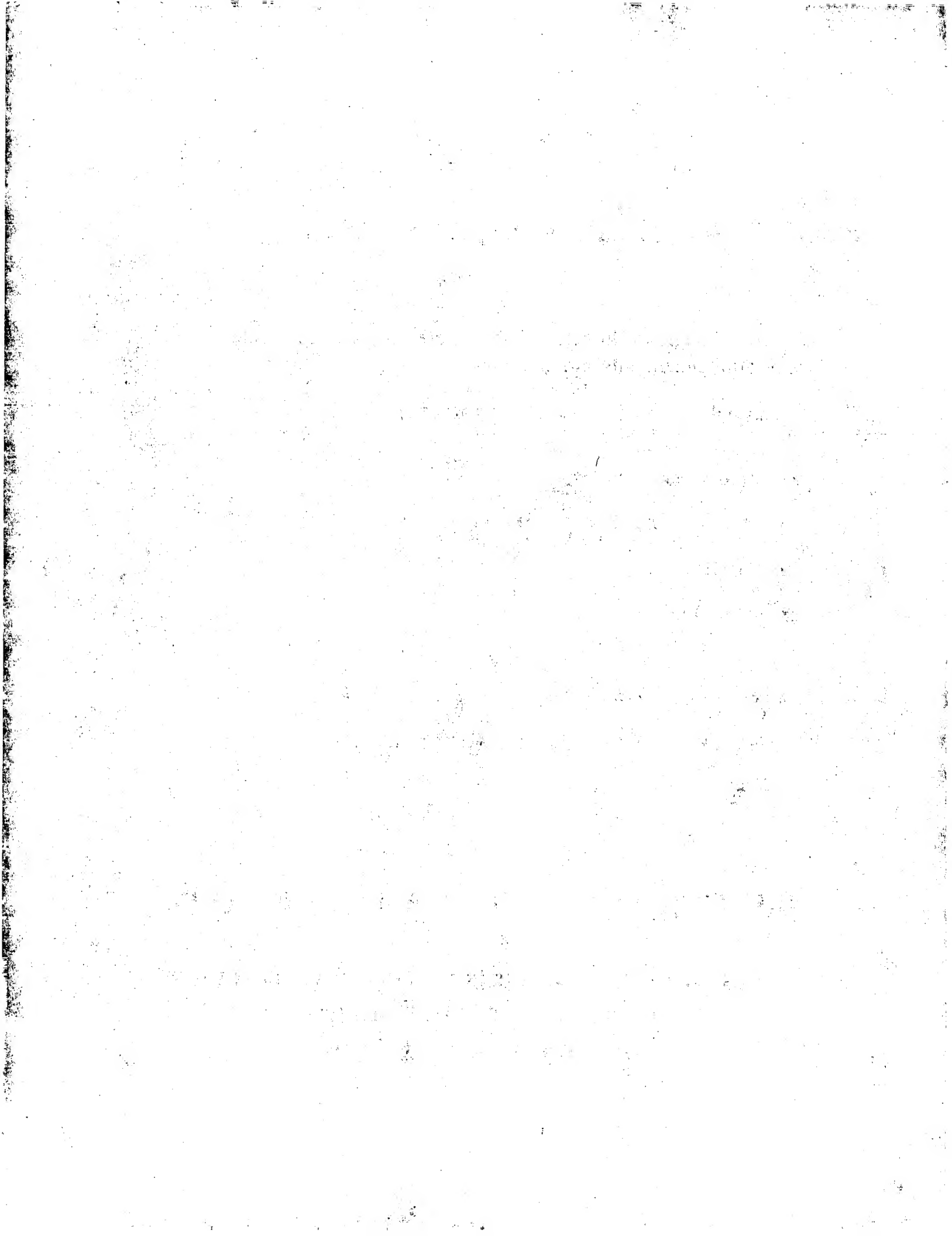
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Voice Verification Biometric Technologies



Veritel's biometric voice verification technology balances the need to tighten security and reduce costs with the inherent convenience of the human voice. Voice verification technology solves countless security problems that require accurate user identity verification, by providing a powerful, non-intrusive solution to protect both proprietary and confidential information.

Veritel's core voice verification technology, VoiceCheck™, can completely replace vulnerable PINs and passwords by enabling identity verification via a user's voice. Veritel's VoiceCheck™ technology is easily deployed in multiple environments, over virtually any platform, including the Internet, wireless networks, and telephony systems.

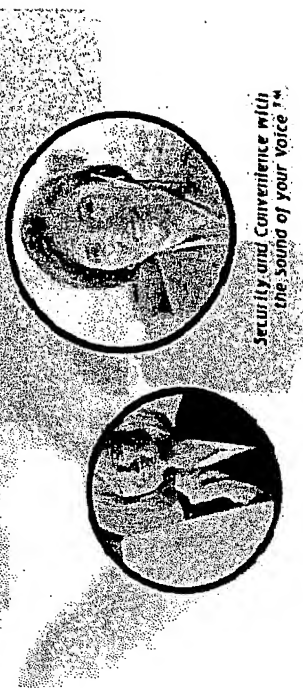
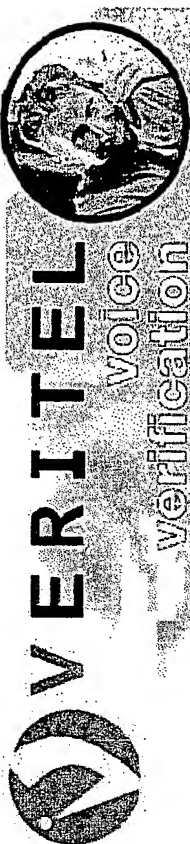
VoiceCheck™ is viable for both small, controlled applications and large-scale implementations, and is language independent, so applications that involve large, global communities are both realistic and affordable. Veritel's voice verification technology delivers *security and convenience with the sound of your voice™*.

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VERITEL
CORPORATION
Voice Verification Technologies

Veritel's VoiceCheck™

A Software Development Kit for Every Environment

The human voice is unique. Only you have your voice. Your tone, your qualities. Only you.

All individuals have a completely unique and natural identifier that they carry with them everywhere they go: their voice. It is easy to use and impossible to misplace or forget. By creating technology that understands the complexities of the human voice, we have revolutionized the way information resources are accessed, protected, and stored. Now, with Veritel's VoiceCheck™ technology, you can have security and convenience, all with the sound of your voice.

At Veritel, we understand that people need a convenient way to stay securely connected to their lives. E-commerce. Calling cards. Voice Mail. Bank-by-phone. Remote network access. Desktop security. Email. Whether you need to add security to an application, control access to your confidential information, or personalize the experience of your product, VoiceCheck™ is the solution. By using your voice for access, you can protect yourself, your company, your family- like nothing else can. With VoiceCheck™, you are guaranteed the most versatile, convenient, accurate, and secure products and applications that are as easy to use as saying your name.

Veritel - Let's Start Talking.

To learn how your business can enhance security across all platforms, such as the Internet, enterprise, telephony and embedded systems, please contact us:

sales@veritelcorp.com
1 888 VERITEL
www.veritelcorp.com

VoiceCheck™ Brings Security and Convenience to All Environments

Features and Benefits

Multi-Layered Security

Voice is an exceptional 2-factor authentication.

Convenient

Voice has been ranked as the least intrusive biometric technology.*

Cost-Effective

VoiceCheck™ technology works with most existing infrastructures.

Language Independent

VoiceCheck™ captures the voice characteristics necessary for future voiceprint comparison, regardless of the language, gender, or accent of the user.

Multiple Platforms

By using one centralized database of voiceprints for all platforms, you can leverage your investment across many communication channels.

Real-Time Enrollment

The entire enrollment procedure takes less than a minute to complete. Users can securely access your business' applications immediately.

VoiceCheck™ Telephony

Your company's call center costs are out of control. By the looks of it, customer service representatives spend almost all of their time simply verifying a caller's identity. If only you could come up with an innovative and easy way to expedite caller identification and increase agent productivity, while also decreasing your costs. You can — with VoiceCheck™ Telephony. The Veritel Solution.

VoiceCheck™ Telephony is Veritel's answer to all of your security problems for telephony-based services. You can improve security and reduce costs by integrating VoiceCheck™ Telephony into your Interactive Voice Response (IVR) system. Just think — your callers can bank, by phone or access confidential information simply by saying their name. No more lengthy verification questions. Password reset for network login and applications will never soak up call center time again. Callers can say their name and a new password is issued. VoiceCheck™ Telephony provides you with peace of mind and lowered call center costs.

Enhance security and convenience for:

- IVR or switch-based computer telephony platforms
- Call centers
- Voice portals
- Mobile commerce

VoiceCheck™ Web

Your customer wants to buy a stock on your site. The one that is going up by the minute. But they can't remember their password. If only they could log on quickly and easily. They can — with VoiceCheck™ Web. The Veritel Solution.

Whether it's intranet or Internet, Veritel's VoiceCheck™ Web technology ensures trusted relationships with your customer base. Not only does it protect unauthorized access to online content, but it also decreases the amount of fraudulent e-commerce transactions, by simply attaching a user's voiceprint to their credit card. Making transactions safe online. A secure, simple and transparent verification system that protects both of you.

Enhance security and convenience for:
• E-commerce transactions
• Internet / Intranet content access
• Internet/Telephony applications

Low storage requirements

For a typical application, which uses an enrollment consisting of multiple renditions of a phrase, the storage requirement is only about 20-30 Kbytes.

Flexible security models

Veritel's software supports "Or," "And," or "Sequential" decision making rules, allowing the application to meet unique security needs. And, the security threshold can be set either high or low, depending on whether tighter security or more convenience is a priority.

Highly Scalable Server Platform

Veritel's software is highly scalable via most of the industry standard relational databases. The verification server is currently available in C++ and Java.

Continual and Advanced R&D

Veritel is committed to continually advancing voice technology to remain in an industry-leading position. Veritel combines the knowledge from dedicated R & D efforts, joint university-based research and leading speech technology experts on staff to create the industry's most fruitful research program.

Technical Specifications

Phrase Length:
1-2 seconds.

Speech Print Size:
8-10K.

Verification Data/Time:

1 phrase, 200 verifications per second (depending on simultaneous use; based on a Quad processor 700MHz Pentium III, 512 MB RAM).

Sample Rate:

Microphone: 16-bit linear at 11KHz sample rate—feature extraction down to 4 Kbytes per second.

Telephone: 8-bit Mu-law at 8KHz sample rate converted to 16-bit linear for multi-platform support—feature extraction down to 4 kbytes per second.

Interfaces:

Direct API calls, COM object, Java Bean, Java Applet, and Active X control

Database Access:

ODBC, JDBC.

VoiceCheck™ Enterprise

You have 100 employees on the network. Four of them are working with extremely confidential client information. No one else should have access to it. If only you could be sure it was secure. You can — with VoiceCheck™ Enterprise. The Veritel Solution.

Secure any program or file from unwanted access with voice verification technology. Operating from within the office or remotely, VoiceCheck™ ensures that the information you want private stays that way. Even if it is your entire hard drive. Whether it's a wireless handheld, a portable laptop, your desktop PC, or the entire network, Veritel is on hand to protect.

Enhance security and convenience for:

- Remote and internal network access
- PC log-on
- File and application access

VoiceCheck™ Embedded Systems

Your customer has lost her cell phone. In New York. She is home. In Chicago. If only you could reassure her that she won't end up with a huge bill. You can — with VoiceCheck™ Embedded Systems. The Veritel solution.

Whether you want to protect mobile devices from theft or fraud, personalize consumer electronics and appliances with user-defined features, or control access to buildings and cars, Veritel's VoiceCheck™ Embedded Systems is the solution. Now, organizations can integrate voice verification into any device. Via an embedded chip or through a separate server. Even if your product is as big as a car or as small as a phone, give your customers what you know they want from their devices: peace of mind, by knowing that no one else but them can use their device unless they authorize it, and a convenient, affordable way to stay securely connected to their lives.

Enhance security and convenience for:

- Handheld PC's, Windows CE devices and other mobile devices such as cell phones
- Home and Car automation systems
- Consumer electronics

Supported Languages:

C++, Java.

Sample Code:

Several test applications are provided as usage examples to streamline integration.

Supported Development Environments:

- MS Visual C/C++ 5.0/6.0,
- MS Visual Basic 5.0/6.0,
- Borland JBuilder 3.0/3.5/4.0.

Minimum System Requirements:

- Pentium, 32MB RAM, standard microphone and sound card,
- Windows 2000, Windows NT 4.0 SP3 or higher, Windows 95/98/ME.



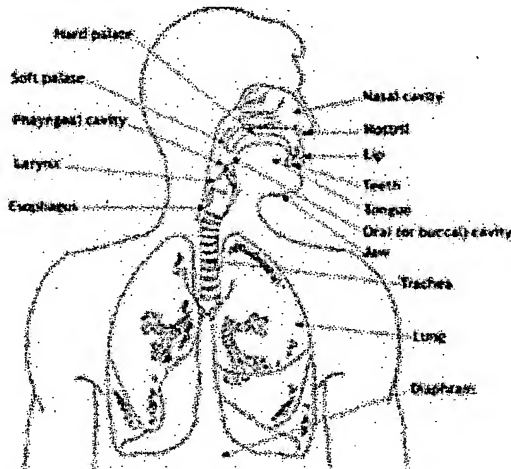
VERITEL
Voice Verification Technology

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*Sun Trust Equities, 2000

Understanding Voice Verification

Veritel develops proprietary voice verification technology, which either confirms or denies a claimed identity on the basis of voice characteristics. These unique features consist of cadence, pitch, tone, harmonics, and shape of larynx. The image below shows how characteristics of voice actually involve much more of the body than just the mouth.



The Voice Verification Process

There are two basic processes in a voice verification system, first, enrollment and then, identity verification. Enrollment creates a reference voiceprint for comparison in the future. Typically the enrollment process takes less than thirty seconds for a user to complete. Verification is the process of comparing a live voice sample to the previously enrolled voiceprint. Verification includes end-pointing, analysis, comparing and scoring.

[Back to Top](#)

Enrollment

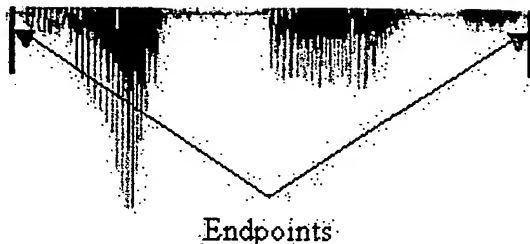
The system will ask the user to say a phrase, for example, the word "Lockbox." The computer represents the phrase graphically as shown below. Although the signal looks as if it starts and stops three times, it is really all part of the same phrase. For Veritel's voice verification technology, the process of finding the beginning and ending of a phrase is the fundamental first step in the voice verification process. Because a person's voice varies every time a particular phrase is said, it is a proven technique to have a person repeat a phrase 2 or 3 times, creating 2 or 3 signal reference files. It is all of these files together that are referred to as a voiceprint.

[Back to Top](#)

End-Pointing

As the first part of the verification process, End-Pointing is the foundation on which the other analyses take place. Veritel's technology uses a technique based on the amount and timing of energy in the signal to find the beginning and ending of the phrase being analyzed. While it is possible to analyze the whole speech signal, there is better information available through analyzing the speech in finer detail. This finer detail is found in a frame.



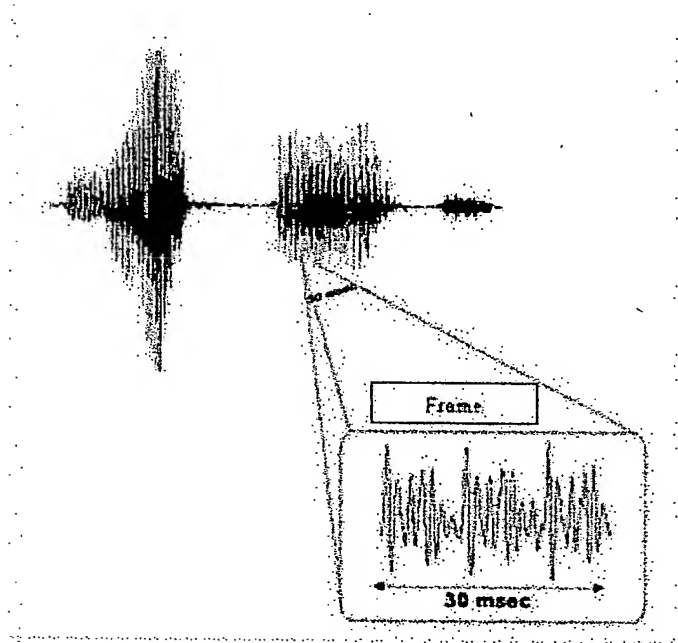


The phrase/word "LockBox"

[Back to Top](#)

Frames

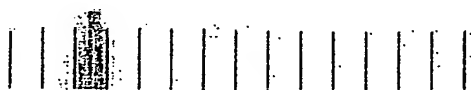
Note the difference between the complete signal and a 30 millisecond (ms) slice. A complete signal has an overall pattern, as well as a much finer structure, called the frame. This frame is the essence of voice verification technology. It is these well-formed, regular patterns that are unique to every individual. These patterns are created from the size and shape of the physical structure of a person's vocal tract. Since no two vocal tracts are exactly the same, no two signal patterns can be the same.

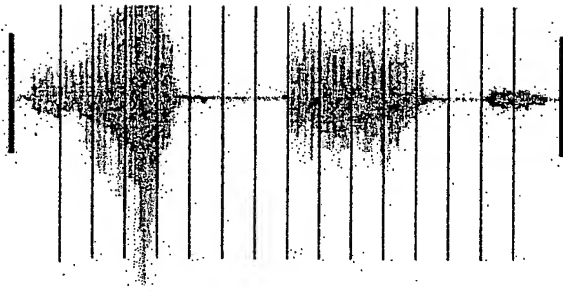


[Back to Top](#)

Analysis

The second step in the verification process is to slice the signal into 30 ms frames and analyze each resulting frame. In order to get even more information from the analysis the frames are actually overlapped like shingles on a roof, 30 ms frames beginning every 10 ms. In two seconds, rather than getting only sixty-seven frames, there are two hundred to analyze and compare. Using a technique called LPC Cepstral Analysis, Veritel's technology computes a set of numbers that represent the physical characteristics of the vocal tract based on the information in the frame. Then, Veritel's technology puts the information from all of the frames together and adds additional information for administrative purposes to create a reference file. These files are then stored in the database and associated with the user.





[Back to Top](#)

Comparing and Scoring

The enrollment and verification processes are identical up to the creation of a signal reference file. The signal reference file created during verification is compared against each rendition of the phrase stored in the database, finding the best match with the multiple reference signal files. Then, the process calculates the difference between the file being presented and the file in the database to create a similarity or confidence score. Both the comparing and scoring are achieved using a method called Dynamic Time Warping, DTW. The 'live' speech is compared to each of the stored versions of that phrase and the best score is identified. That score is converted to a number between 0 and 100 with 100 being a perfect match. This confidence score can then be compared to a threshold value to decide to accept or reject the speaker.

[Back to Top](#)

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Product Overview

Voice verification solves a myriad of security needs that require cost-effective, accurate, and convenient user identity verification. Veritel's technology provides a powerful, non-intrusive solution to protect both proprietary and confidential information. In addition to meeting a functional need, your company will also realize a return on investment through cost savings, productivity gains, and added value to your own products and services.

Veritel's voice verification is easily deployed in multiple environments, over virtually any platform, including the Internet, wireless networks, and telephony systems. From pre-designed products, such as Veritel's automatic password reset application, Speak N Set™, and ID-key™ to licensing the company's core voice verification technology, VoiceCheck™, Veritel offers the most effective and user-friendly security solutions available.

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Business Challenges...

Several buildings across your corporate campus contain highly classified information and access to mission critical applications. Access to these locations must be protected, but employees always lose the cards for card-based access control security systems, and systems that use passwords or PINs only require that an individual know a specific number to gain entry. The corporation needs to tighten access control security, with a cost-effective and user-friendly solution.

Did you know...

According to security experts, people are the weak links in your data center or collocation facility's chain of command: The majority of security breaches can be traced to human, not electronic, failings.
Internet World, 2001

The average organization loses about 6% of its annual revenue to fraud and abuse committed by its own employees.
Association of Certified Fraud Examiners, 2000

Biometrics systems can be used not only to ensure that authorized people gain access to places, devices, data and transactions, but also to fix the identity and time of access, ..., and coupled with administrative systems they can establish near irrefragable audit trails that are extremely difficult to repudiate.
Morgan Keegan & Company, 2001

"We needed something that provided security for access control to all of the vault locations across the plant. The voice biometric was the cheapest and easiest to install of all of the biometrics and other solutions we considered. We thought about retina and thumb biometric systems, but they would have been too costly to implement because there are so many vault locations across the three-mile wide plant campus. Anything aside from voice just wasn't feasible."

Steve Mays, current manager of Veritel's ID-key system at the Department of Energy's Y-12 Plant in Oak Ridge, TN

ID-key™ uses biometric voice verification technology to extract the unique characteristics of a person's voice to verify their identity. Your voice identifies you and you alone. It can't be forgotten, stolen, or misplaced. And, unlike a PIN, password, or card, your voice cannot be shared with others, it doesn't wear out, and it doesn't need to be replaced. Now, employees can simply and conveniently speak to gain entry through access control systems.

ID-key™ Tightens Security:

- ID-key™ ensures that your building is protected from unwanted access
- Biometrics provide a higher degree of security than traditional PINs and passwords
- Biometric voice verification technology accurately confirms a person's claimed identity based on the unique features of his or her voice
- Unlike tokens, cards, PINs, and passwords, your voice cannot be shared, stolen, or forgotten

ID-key™ is Convenient and Saves Time:

- Voice has been ranked as the least intrusive biometric technology by the International Biometric Group, Morgan Keegan Research, the International Data Group, Federal Computer Week, and others
- With ID-key™, a user's identity can be verified in less than one tenth of a second, enabling users to gain the appropriate door access, quickly and conveniently
- ID-key™ stores all of an organization's voiceprints in a centralized server, so users can verify their identity with voice verification at multiple doors
- System administrators can monitor all of the access control activity remotely

ID-key™ is Cost-Effective:

- Voice verification eliminates the need for PINs, passwords, cards, tokens and their associated costs
- Employees will spend less time tracking their lost cards and more time on their jobs
- Biometric voice verification system protects from an insider threat that could potentially cost significant amounts of money related to fraud and abuse

ID-key™ is Proven in the Field:

- ID-key™ successfully enables access control security in 9 locations nation-wide

VoiceCheck™ Software Development Kit

VoiceCheck™ is Veritel's core voice verification technology. The VoiceCheck™ Software Development Kit (SDK) is a combination of advanced mathematics, database interface, and Application Protocol Interface (API). It enables application developers to incorporate Veritel's technology into virtually any security application, on multiple platforms.

Did you know that *poor security significantly increases costs* for. . .

Telephony Systems

It has been estimated that internal help desks spend as much as 65% of their time resetting forgotten, lost, or shared passwords, according to DFI International. 2000

Enterprise Computing

Fortune 1000 companies sustained losses of more than \$45 billion in 1999 from the theft of proprietary information, according to a study by the American Society for Industrial Security (ASIS) and consulting firm PricewaterhouseCoopers.

Internet

PriceWaterhouse Coopers claims that credit card security accounts for 79% of the barriers to online purchasing. 2000

Embedded Devices

By 2004, over 150 million people are expected to use mobiles or PDAs for wireless banking or other financial transactions, according to Wirednews.com

Veritel's biometric voice verification technology **significantly decreases costs**, while **enhancing security**, for many applications on the web, embedded devices, and telephony systems. Through the science of biometrics, which measures people's unique characteristics, Veritel provides an cost-effective, accurate, and convenient way to identify individuals. Veritel's technology either "accepts" or "denies" a speaker's claimed identity by comparing a live voice sample to a previously enrolled voiceprint. Since every voiceprint is unique, individuals can use their voice as a password, granting them access to networks, Web sites, and telephony systems.

VoiceCheck Reduces Expenses

- Voice Verification can completely eliminate the need for PINs and passwords, and the associated time intensive hassles and costs due to password reset.
- Identifying users via automatic voice verification streamlines the user authentication process. For telephony systems, this greatly reduces the duration of call length and the resources needed to support a Call Center or Help Desk.
- Voice verification significantly reduces fraud in all industries. Voice verification can be implemented to secure the front-end of a system, prohibiting hackers from breaking into telephone networks and proprietary databases, or can control access to specific applications and data.

VoiceCheck™ Tightens Security

- Biometrics provide a higher degree of security than traditional PINs and passwords
- Biometric voice verification technology accurately confirms a person's claimed identity based on the unique features of his or her voice
- Unlike tokens, cards, PINs, and passwords, your voice cannot be shared, stolen, or forgotten

VoiceCheck™ is Convenient and Increases Customer Satisfaction

- Saying your name is as natural as saying, "Hello".
- Identity verification with VoiceCheck™ takes the user less than one tenth of a second.
- Voice verification enables products and services to be personalized to each unique user, enabling one-to-one marketing and increased revenue for companies.

VoiceCheck™ Telephony

The standard C++ interface allows for the integration of voice verification into Interactive Voice Response (IVR) systems or switch-based computer telephony platforms. As m-Commerce becomes a more accepted practice of performing financial transactions, the need to verify a user's identity via any telephony input device will be of the utmost importance.

VoiceCheck™ Web

A Java interface has been designed to enable voice verification and replace PINs and typed passwords on the Internet. VoiceCheck™ Web Client performs a feature-extraction process at the client device. Features extracted from a user's utterance range from a simple voice capture to an encrypted, fully digitized voiceprint.

VoiceCheck™ Embedded

Veritel's voice verification technology is a compact package optimized for use in Digital Signal Processors, RISC processors, and general-purpose processors. VoiceCheck™ Embedded performs on a single chip the same type of feature-extraction that VoiceCheck™ Web performs in the client, without the overhead associated with a Java Virtual Machine or Windows operating system. Due to the small footprint and low power consumption, the voiceprints can be stored on the client's device or on a separate server. With the client-server implementation method, the voiceprint can be transmitted through any wired or wireless transmission protocol, such as TCP/IP, Bluetooth, or IEEE802.11. This product is in the design/prototype stage.

[View a brochure on VoiceCheck™ SDK.](#)

You will require Acrobat Reader to view the brochure. if you do not have the plug-in, click



to download it, then reopen your browser.

[Back to Top](#)

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Frequently Asked Questions

What is the difference between voice verification and voice recognition?

Do I need to own speech recognition to use voice verification?

Was Veritel's voice verification technology developed by Veritel or licensed?

Who are Veritel's competitors? What is your advantage?

Is VoiceCheck™ language dependent?

Will I be able to use the system if I have a cold or my voice is really groggy from just waking up in the morning?

Will it accept my recorded voice?

Do I need a phone to do voice verification on the Web?

Can I adjust the security level? What is the threshold?

Why do I have to enroll three times on three different phone devices?

Do you have to enroll all three devices at the same time?

What happens if you don't complete your enrollment process? Does it lock you out?

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What is the difference between voice verification and voice recognition?

Voice verification, which is sometimes referred to as speaker verification or speaker authentication, verifies the claimed identity of a speaker. Voice recognition identifies words and phrases that a speaker is saying.

[Back to Top](#)

Do I need to own voice recognition to use voice verification?

No. Veritel's VoiceCheck™ technology can stand-alone or be bundled with the company's recognition partners.

[Back to Top](#)

Was Veritel's voice verification technology developed by Veritel or licensed?

Veritel develops and owns the VoiceCheck™ voice verification technology -- making Veritel's technology advances and upgrades controllable and timely.

[Back to Top](#)

Who are your competitors? What is your advantage?

Primarily, Veritel's competitors are PINs and passwords. However, in the end, they cost companies money, whereas Veritel's voice verification is a cost-effective solution for

security needs.

Biometric technology provides a higher degree of security over traditional PINs and passwords. Of all the security biometrics available today, voice biometrics are recognized as the most natural interface to users. In fact, the voice biometric is ranked number one when measured against the criteria of accuracy, convenience, and cost based on Morgan Keegan's "Biometric and Natural Interface Technologies" market study. And, many other industry groups have ranked voice as the least intrusive biometric technology. Industry experts think that voice verification has the greatest potential for widespread acceptance in the commercial market, because voice verifying is as natural as saying hello. Additionally, there are no cumbersome, huge machines to buy, install, and instruct people how to use. A simple microphone, as found in a telephone or computer, is all that is needed.

Veritel differs from other voice biometric companies in many ways. First, Veritel's core competency is the development of biometric voice verification security software. Veritel will remain solely focused on bringing the best voice verification solutions to market. Additionally, Veritel's technology is designed to be compact and quick; an enrollment takes less than thirty seconds, and verification takes less than a tenth of a second to complete. Therefore, Veritel's technology requires substantially less processing power than others to achieve a superior result. This also enables Veritel's technology to be embedded in handheld, mobile devices. Lastly, Veritel's technology is language independent and employs the user-friendly phrase-based method of verification, which enables Veritel's technology to be used in the global marketplace.

[Back to Top](#)

Is VoiceCheck™ language dependent?

No. Veritel's technology is not tied to a language dictionary. As a result, the technology is highly scalable and your business expansion is thus unlimited.

[Back to Top](#)

Will I be able to use the system if I have a cold or my voice is really groggy from just waking up in the morning?

Yes. The VoiceCheck™ enrollment process captures the unique characteristics of an individual's vocal tract, which consists of the air passages from the top of the lungs, to the throat, the mouth, and the nasal cavity. A severe cold might cause intense swelling of your throat or nasal passages, making it a little more difficult to verify your voice. A morning voice is a temporary condition, mainly caused by an accumulation of mucus that can interfere with speech production. This condition usually subsides quickly when the user starts speaking for the day. If a verification attempt fails, it is usually a good idea to give it another try a short time later. By then, the voice should have cleared and the attempt should be successful.

[Back to Top](#)

Will it accept my recorded voice?

No. A recorded voice will not be accepted against your stored voiceprint, which is translated from the acoustics of your 'live' voice. The electronic properties of a recording device, particularly the playback speaker, will change the acoustics to such a degree that the recorded voice sample will not match a stored voiceprint of your 'live' voice.

[Back to Top](#)

Do I need a phone to do voice verification on the Web?

No. VoiceCheck™ is a true Web-enabled technology that requires you to use the standard microphone on your laptop or PC to voice verify.

[Back to Top](#)

Can I adjust the security level? What is the threshold?

Yes, an important feature of Veritel's technology is the ability to adjust the threshold of the security system to match the real-world environment in which verification will be

the security system to match the real-world environment in which verification will be taking place. A threshold is defined as "a level, point, or value, above which something is true or will take place and below which it is not or will not." For maximum security, you would set the security level, or the threshold, at 0 to minimize the chance of allowing an imposter access to the protected application. However, such an extreme level of security may not be necessary for all business applications, such as those that emphasize the need for convenience and anytime, anywhere access. In those cases, the threshold would be set lower to minimize the likelihood that true callers would be rejected from the system.

[Back to Top](#)

Why do I have to enroll three times on three different phone devices?

The VoiceCheck™ algorithm is most effective when you have enrolled multiple times. Each time you enroll, your voiceprint will be slightly different, reflecting the natural changes in voice intonation and inflection. So, whenever you try to verify, the algorithm will check your live voice sample against all of the voiceprints you have stored in the database, increasing the chance of consistent and successful verification.

Veritel recommends enrolling from all the different types of environments from which you might verify in the future: your office phone, your cellular, your home phone, even a pay phone on the street. When you call into the system to voice verify, the microphone picks up more than just your voice. These different environments all contain various levels of background noise, which is then also included in your voice sample. Therefore, it is most effective to have your voice, in all of these environments, stored in the database. Your phone at work probably delivers the highest quality voice sample. Your cordless at home will have to overcome the limitations of the electrical noise generated from home appliances. The pay phone on the street will create a voiceprint with the greatest quantity of background noise. By having all of these environments on the database, the algorithm can check your live voice sample against one of your prints to successfully verify.

[Back to Top](#)

Do you have to enroll all three devices at the same time?

No, you have the option of enrolling the individual devices whenever you wish. Veritel recommends that the device enrollment be done quickly, however, so the user does not have to remember their initial PIN code for a long period of time.

[Back to Top](#)

What happens if you don't complete your enrollment process? Does it lock you out?

No, Veritel's technology will not lock you out if you don't complete the enrollment process. If you are trying to enroll from your cellular phone and the connection is lost before the enrollment procedure is complete, your enrollment will fail. You will simply re-enroll from the same device that the enrollment failed on. Veritel's technology will also delete the temporary enrollment files if the enrollment was not completed.

[Back to Top](#)

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